U.S. Department of Energy
Office of Electricity

DE-FOA-0003549
REQUEST FOR INFORMATION (RFI)

ISSUE DATE: January 10, 2025

RESPONSES DUE: February 28, 2025

TITLE: De-risking Innovative Grid Technologies to Facilitate Adoption of Solutions that Promote Reliability, Resilience, Security, and Affordability

Program Area: Applied Grid Transformation Solutions (AGTS), Office of Electricity (OE), U.S. Department of Energy (DOE)

Purpose:

The purpose of this Request for Information (RFI) is to obtain input to inform planning of the Office of Electricity's Applied Grid Transformation Solutions (AGTS) program. The AGTS program was initiated in 2023 with a focus on facilitating the adoption of innovative grid technologies that broaden the reliability, resilience, security, and affordability of the Nation's electricity delivery infrastructure as it is being transformed to meet a more dynamic, decentralized, and complex operating environment, including new and emerging threats and challenges. Through assembling and enhancing test bed capabilities to safely stress test advanced grid technologies in extreme conditions and identify research and development (R&D) needs, assessing pilot demonstrations in integrated and operational environments to document best practices and capability gaps, and developing decision-making tools and resources for a variety of stakeholders, the AGTS program aims to de-risk innovative grid technologies, close the loop on grid R&D and innovation, and increase awareness of advanced grid solutions that can accelerate grid modernization and facilitate its transformation.

Background:

America's electric grid is transforming into a more dynamic, decentralized, and structurally complex system with greater uncertainty, critical infrastructure interdependencies (e.g., natural gas, information and communication technologies), and bidirectional power flows in distribution systems. These changes are occurring in the face of greater penetration of inverter-based resources, load growth from transportation electrification, data centers, and fuel switching in the industrial and building sectors, and evolving and emerging threats and challenges (e.g., cyberattacks, physical attacks, extreme weather events, wildfires, supply chain disruptions, aging infrastructure).

Managing this transition responsibly and effectively requires significant reengineering and advancements in grid solutions and system architectures to promote the reliability, resilience, security, and affordability of the electricity delivery infrastructure. There is a pressing need to systematically test, validate, and evaluate functionality and performance of innovative grid technologies to assess their ability to meet emerging demands and new requirements, including their integrability into an increasingly complex legacy system and compatibility with diverse operational, institutional, and regulatory contexts. Stress testing these technologies will also strengthen their reliability and performance under blue sky, grey sky, and black sky conditions. Independent and robust assessments of advanced grid solutions will help build awareness and confidence in their performance and benefits for an industry focused on safety and reliability.

The AGTS program facilitates the adoption of innovative grid technologies (e.g., energy storage systems, next-generation transmission and distribution equipment, power control and conversion hardware, grid sensors and associated software) by performing stress tests and assessing pilot demonstrations in integrated and operational environments to provide industry with the data and insights needed to inform infrastructure investment decision-making. These activities will also inform future grid R&D plans by surfacing, identifying, and analyzing performance limitations, especially under extreme conditions. The AGTS program aims to de-risk advanced grid solutions prior to their deployment in the field and will help close the loop on grid technology R&D and innovation.

Grid test beds are vital tools in the technology development process, providing capabilities to evaluate a technology's performance, safety, security, and reliability in a controlled and realistic environment prior to integration with operational assets and systems. The AGTS program plans to employ the unique capabilities available at domestic facilities to provide industry with a coordinated platform to support testing and validation of innovative grid technologies for a variety of use cases. Additionally, documenting and assessing pilot demonstrations will yield actionable information required by industry to facilitate adoption, including operational and integration requirements, validated functionality and performance, and quantified economic benefits.

Requested Information:

This RFI solicits input from utilities, vendors, technology developers, consultants, research organizations, test bed facilities, national laboratories, academia, State and regulatory entities, and other interested persons on various aspects of the AGTS program including some current activities. **You may respond to as few or as many of the questions below. Please use the question numbers as headings in your**

response and refer to the questions in the body of your response. Please be as specific as possible in all responses.

Section 1. General Questions

1. What information (e.g., techno-economic analysis, demonstration report), evidence (e.g., pilot demonstration, hardware-in-the-loop testing), and/or certification is needed to de-risk innovative grid technologies, building sufficient confidence to spur their adoption?
2. What are the advantages and/or disadvantages of utilizing test beds to de-risk an innovative grid technology compared to conducting a field demonstration or early-stage deployment?
3. What specific innovative grid technologies require de-risking in the near-term (1-3 years), mid-term (4-7 years) and long-term (8+ years)? What information and/or evidence is needed for each?
4. What is the biggest barrier to greater adoption of innovative grid technologies in transmission and distribution systems (e.g., integration cost, systems interoperability, regulatory support, information asymmetry)? If there are multiple barriers, please rank them from largest to smallest.
5. What challenges, issues, or factors have been successful in driving the adoption of advanced grid solutions in transmission and distribution systems? What specific benefits did the technology provide?
6. What is your most trusted source of information to learn about innovative grid technologies or to support infrastructure investment decisions (e.g., webinars, training, conferences, consultant)? If there are multiple trusted information sources, please rank them from highest to lowest.

Section 2. U.S. Electric Grid Test Beds

DOE is seeking input related to domestic, publicly accessible facilities (“test beds”) that perform testing, evaluation, validation, and certification of transmission and distribution (T&D) grid hardware and software technologies, including grid-scale energy storage, grid sensors, grid communication and control systems, and associated software. Test beds of interest are those that can be used to assess a grid technology prior to deployment and integration in the field with operational utility equipment, assets, and/or systems.

Section 2.1: Test Bed Capabilities and Capacity

7. What advancements in electric grid test bed capabilities are needed to support grid transformation? What is the biggest testing capability gap that slows the industry from adopting innovative technologies in transmission and distribution systems?

8. What facilities and/or test bed capabilities are needed to evaluate innovative technologies from a grid operator perspective? What gaps, if any, do you see in Human Machine Interface (HMI) testing and human factors studies?
9. Are there testing constraints that are currently inhibiting innovative grid technologies from entering the market? If so, which tests, which technologies, and why?
10. What can the DOE do to help address these challenges?

Section 2.2: U.S. Electric Grid Test Bed Inventory

The AGTS program created the U.S. Electric Grid Test Bed Inventory to aid T&D technology developers, integrators, electric utilities, grid operators, and other industry stakeholders in identifying test beds at national laboratories, utilities, commercial entities, and academia to assess promising new technologies.

11. Based on the test beds of interest, please provide a list of facilities missing from the inventory that you are aware of. What additional features or information would make this online tool more useful?
12. What functional and/or technology capabilities beyond those listed in the online tool are important to highlight or include? Feedback on the capability definitions is also welcomed.
13. What additional challenges or concerns prevent an interested party from accessing and utilizing a test bed included in the inventory (e.g., testing costs, data protection, intellectual property)? Please list them in the order of importance.

Section 2.3: National Grid Test Bed Network

An envisioned national grid test bed network would consist of federating testing facilities and connecting capabilities to run hardware-in-the-loop (HIL) and/or power hardware-in-the-loop (PHIL) simulations, leveraging the Energy Science Network (ESnet) funded by DOE's Office of Science.

14. What opportunities and challenges do you foresee with connecting test bed capabilities at DOE national laboratories, other federally funded laboratories, commercial/private facilities, and/or academic laboratories to run large-scale HIL and PHIL simulations?
15. What specific use cases would such a testing network enable that could not be performed at a single facility and/or on a local model/simulation? What additional capabilities beyond real-time digital simulation, if any, would be needed to enable implementation of these networked use cases?
16. What type of system models are needed to confidently assess performance and interoperability of innovative grid technologies in simulated environments? Are

IEEE reference systems sufficient or are actual system models needed? Are updates and more dynamic models needed?

17. How can the DOE implement a robust and collaborative grid test bed network that leverages the complementary capabilities at DOE national laboratories, other federally funded laboratories, commercial/private facilities, and/or academic laboratories?

Section 3. Scaling, Replicating, and Extending Demonstration Projects

18. What is the biggest barrier, real or perceived, for scaling, replicating, and extending the results of a grid technology pilot or demonstration project within a utility and/or across utilities and jurisdictions? If there are multiple barriers, please rank them from largest to smallest.
19. What specific information from a pilot or demonstration project would be the most useful in helping decision-makers better understand, consider, and/or adopt an innovative grid technology?
20. Who are the critical stakeholders that need to be convinced that a grid technology has merit, and that the technology is sufficiently de-risked to support its scaling, replicating, and/or extension?
21. What can the DOE do to help address these challenges?

Disclaimer and Important Notes:

This RFI is not a Notice of Funding Opportunity (NOFO); therefore, DOE is not accepting applications at this time. DOE may or may not elect to issue a NOFO in the future based on or related to the content and responses to this RFI. There is no guarantee that a NOFO will be issued as a result of this RFI. Responding to this RFI does not provide any advantage or disadvantage to potential applicants if DOE chooses to issue a NOFO regarding the subject matter.

Any information obtained as a result of this RFI is intended to be used by the Government on a non-attribution basis for planning and strategy development; this RFI does not constitute a formal solicitation for proposals or abstracts. Your response to this notice will be treated as information only. DOE will not respond to individual submissions or publish publicly a compendium of responses. DOE will review and consider responses in its formulation of program strategies. Responses to this RFI will not be viewed as a binding commitment to develop or pursue the project or ideas discussed.

DOE will not provide reimbursement for costs incurred in responding to this RFI. Respondents are advised that DOE is under no obligation to acknowledge receipt of the information received or to provide feedback to respondents with respect to any

information submitted under this RFI. Responses to this RFI do not bind DOE to any further actions related to this topic.

Proprietary Information:

Because information received in response to this RFI may be used to structure future programs and NOFOs and/or otherwise be made available to the public, **respondents are strongly advised NOT to include any information in their responses that might be considered business sensitive (e.g., commercial or financial information that is privileged or confidential), trade secrets, proprietary, or otherwise confidential.** If, however, a respondent chooses to submit business sensitive, trade secrets, proprietary, or otherwise confidential information, it must be clearly and conspicuously marked as such in the response.

Freedom of Information Act:

Information included in any submission may still become public via a requirement to disclose under the Freedom of Information Act or other federal law or regulation.

Consistent with 10 CFR 1004.11, DOE requires that any person submitting information that they believe to be confidential and exempt by law from public disclosure should submit **two well-marked copies**: one copy of the document marked "confidential" which must clearly and conspicuously identify the business sensitive, trade secrets, proprietary, or otherwise confidential information, and one copy of the document marked "nonconfidential" with the information believed to be confidential deleted. **Failure to comply with these marking requirements may result in the disclosure of the unmarked information under the Freedom of Information Act or otherwise.** The Government is not liable for the disclosure or use of unmarked information and may use or disclose such information for any purpose.

If you choose to provide business sensitive, trade secrets, proprietary, or otherwise confidential information, you must include a cover sheet marked as follows identifying the specific pages containing business sensitive, trade secrets, proprietary, or otherwise confidential information:

> **Notice of Restriction on Disclosure and Use of Data**: Pages [List Applicable Pages] of this response may contain business sensitive, trade secrets, proprietary, or otherwise confidential information that is exempt from public disclosure. Such information shall be used or disclosed only for the purposes described in this RFI DE-FOA-0003549. The Government may use or disclose any information that is not appropriately marked or otherwise restricted, regardless of source.

In addition, (1) the header and footer of every page that contains business sensitive, trade secrets, proprietary, or otherwise confidential information must be marked as follows: “Contains Business Sensitive, Trade Secrets, Proprietary, or Otherwise Confidential Information Exempt from Public Disclosure” and (2) every line and paragraph containing such information must be clearly marked with double brackets or highlighting. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

Evaluation and Administration by Federal and Non-Federal Personnel:

Federal employees are subject to the non-disclosure requirements of a criminal statute, the Trade Secrets Act, 18 USC 1905. The Government may seek the advice of qualified non-Federal personnel. The Government may also use non-Federal personnel to conduct routine, nondiscretionary administrative activities. The respondents, by submitting their response, consent to DOE providing their response to non-Federal parties. Non-Federal parties given access to responses must be subject to an appropriate obligation of confidentiality prior to being given the access. Submissions may be reviewed by support contractors and private consultants.

Request for Information Response Guidelines:

Responses to this RFI must be submitted electronically to DOE-OE-AGT@hq.doe.gov with the subject line "DE-FOA-0003549 - RFI - Organization Name" no later than 8:00pm (ET) on **February 28, 2025.**

Responses must be provided as attachments to an email (File Name – “DE-FOA-0003549 - RFI - Organization Name”. It is recommended that attachments with file sizes exceeding 25MB be compressed (i.e., zipped) to ensure message delivery. Responses must be provided as a Microsoft Word (.docx) or PDF attachment to the email, and no more than 15 pages in length, 12-point font, 1-inch margins. Only electronic responses will be accepted.

Format Guidance for RFI Submission:

For ease of replying and to aid categorization of your responses, **please copy and paste the RFI questions, including the question numbering, and use them as a template for your response.** Respondents may answer as many or as few questions as they wish and may delete unanswered questions.

Respondents are requested to provide the following information at the start of their response to this RFI:

1. Contact person’s first and last name

2. Contact person’s title

3. Contact person’s organization / institution name, street address, city, state, and zip code

4. Contact person's phone number and e-mail address

5. Which category best describes your organization / institution?

a. Electric cooperative utility
b. Electric municipal/public power utility
c. Small investor-owned electric utility (<4,000,000-megawatt hours electricity sales per year)
d. Other investor-owned electric utility
e. Other energy provider (solar, wind, hydropower, etc.)
f. Energy sector vendor solution provider
g. Energy sector service provider
h. Other commercial entity
i. Not-for-profit national trade association
j. State or local government entity
k. Academic or research organization
l. Non-profit community-based organization
m. U.S. National laboratory
n. Other, please specify: